

Claims

What is claimed is:

1. A method for accepting a plurality of parallelepiped packages of random size and shape and selecting one of said packages on an accumulator for placement at a different location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a" ;
- c) accumulating said packages in side justified alignment on an accumulator in the order which they were received; and
- d) selecting individual packages from said accumulator for placement at said designated location, said selection based on the assistance of data received through step "b".

2. The method as claimed in Claim 1, wherein step "b" is accomplished by actually measuring the outside dimension of each package after it is received.

3. The method as claimed in Claim 1, wherein step "b" is accomplished by referencing a dimensional reading assigned to each of said packages prior to their receipt.

4. The method as claimed in Claim 1, wherein in step "c" said packages are aligned in side justified line contact.

5. A method for accepting a plurality of parallelepiped packages of random size and shape and selecting one of said packages on an accumulator for placement at a different designation location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of each package of said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a";
- c) accumulating said packages on a one-way accumulator in side justified line contact in the order which they were received; and
- d) selecting and removing packages in non-sequential order from said accumulator.

6. The method as claimed in Claim 5, wherein step "b" is accomplished by actually measuring the outside dimension of each package after it is received.

7. The method as claimed in Claim 5, wherein step "b" is accomplished by referencing a dimensional reading assigned to each of said packages prior to their receipt.

8. A method for accepting a plurality of parallelepiped packages of random size and shape and stacking said packages together at a designated stack location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of each package in said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a";
- c) accumulating said packages on an accumulator in line contact in the order in which they were received;
- d) identifying one of said packages on said accumulator and one package placement position at said stack location capable of receiving said identified package;
- e) at least partially evaluating the stability of said selected package at said placement position by use of preselected stability criteria, and
- f) giving preference to placing said package at said package placement position based upon said stability criteria.

9. The method as claimed in Claim 8, wherein step "b" is accomplished by actually measuring the outside dimension of each package after it is received.

10. The method as claimed in Claim 8, wherein step "b" is accomplished by referencing a dimensional reading assigned to each of said packages prior to their receipt.

11. A method for accepting at least one parallelepiped package of random size and shape and stacking said package together at a designated stack location, said method comprising the steps of:

- a) receiving at least one parallelepiped package;
- b) determining at least one outside length dimension of said unstacked parallelepiped package received in step "a" , said determination being made in the order said packages were received in step "a";
- c) identifying at least one package placement position at said stack location capable of receiving said identified package;
- d) at least partially evaluating the stability of said unstacked identified package at said placement position by determining the percentage of support the package bottom surface would receive if placed at said position, and applying said percentage against a threshold, and
- e) placing said package at said package placement position only if said threshold is reached.

12. The method as claimed in Claim 11, wherein step "b" is accomplished by actually measuring said outside dimension after said package is received.

13. The method as claimed in Claim 11, wherein step "b" is accomplished by identifying said package and referencing a dimensional reading assigned to said package prior to its receipt.

14. The method of stacking packages as claimed in Claim 11, wherein said designated stack location is a pallet and in said step "d" a determination is made of the support said package would receive if placed atop a bare pallet surface configured to accept a plurality of packages thereon.

15. A method for accepting a plurality of parallelepiped packages of random size and shape and stacking said packages together at a designated stack location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of each package in said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a";
- c) accumulating said packages on an accumulator in line contact in the order in which they were received;
- d) identifying one of said packages and one package placement position at said stack location capable of receiving said identified package;
- e) at least partially evaluating the stability of said unstacked identified package at said placement position by determining the percentage of support the package bottom surface would receive if placed at said position, and applying said percentage against a threshold, and
- f) placing said package at said package placement position only if said threshold is reached.

16. The method as claimed in Claim 15, wherein step "b" is accomplished by actually measuring the outside dimension of each package after it is received.

17. The method as claimed in Claim 15, wherein step "b" is accomplished by referencing a dimensional reading assigned to each of said packages prior to their receipt.

18. The method of stacking packages as claimed in Claim 15, wherein in said step "d" a determination is made of the support said package would receive if placed atop a previously stacked package.

19. A method for accepting at least one parallelepiped package of random size and shape and stacking said package together at a designated stack location, said method comprising the steps of:

- a) receiving at least one parallelepiped package;
- b) determining at least one common outside length dimension of said unstacked parallelepiped package received in step "a" , said determination being made in the order said packages were received in step "a";
- c) identifying at least one package placement position at said stack location capable of receiving said identified package;
- d) at least partially evaluating the stability of said unstacked identified package at said placement position by determining the effective support surface available to the package bottom surface if placed at said, position, said effective support surface defined by an effective support surface boundary, and comparing said effective support surface to a defined gravity center region assigned to said unstacked identified package, said gravity center region defined as a region on the bottom surface of said package through which the gravity center force vector of said unstacked package is likely to pass, and
- e) placing said package at said package placement position only if said gravity center region falls within said effective support surface boundary.

20. The method as claimed in Claim 19, wherein step "b" is accomplished by actually measuring said outside dimension after said package is received.

21. The method as claimed in Claim 19, wherein step "b" is accomplished by identifying said package and referencing a dimensional reading assigned to said package prior to its receipt.

22. The stacking method as claimed in Claim 19, wherein said effective support surface boundary determined in step "d" is at least partially defined by solid package support extending below said package bottom surface through at least one layer of packages therebelow.

23. A method for accepting a plurality of parallelepiped packages of random size and shape and stacking said packages together at a designated stack location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of each package in said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a";
- c) accumulating said packages on an accumulator;
- d) identifying one of said packages on said accumulator and one package placement position at said stack location capable of receiving said identified package;
- e) at least partially evaluating the stability of said unstacked identified package at said placement position by determining the effective support surface available to the package bottom surface if placed at said position, said effective support surface defined by an effective support surface boundary, and comparing said effective support surface to a defined gravity center region assigned to said unstacked identified package, said gravity center region defined as a region on the bottom surface of said package through which the gravity center force vector of said unstacked package is likely to pass, and
- f) giving preference to placing said package at said package placement position if said effective support surface sufficiently overlaps said gravity support region.

24. The method as claimed in Claim 23, wherein step "b" is accomplished by actually measuring the outside dimension of each package after it is received.

25. The method as claimed in Claim 23, wherein step "b" is accomplished by referencing a dimensional reading assigned to each of said packages prior to their receipt.

26. The stacking method as claimed in Claim 23, wherein said effective support surface boundary determined in step "e" is at least partially defined by solid package support extending below said package bottom surface through at least one layer of packages therebelow.

27. A method for accepting a plurality of parallelepiped packages of random size and shape and stacking said packages together at a designated stack location, said method comprising the steps of:

- a) receiving said packages in a random manner;
- b) determining at least one common outside length dimension of each package in said plurality of packages received in step "a" , said determination being made in the order said packages were received in step "a";
- c) accumulating said packages on an accumulator;
- d) identifying one of said packages on said accumulator and one package placement position at said stack location capable of receiving said identified package and being atop at least one previously-stacked package;
- e) at least partially evaluating the stability of said selected package at said placement position by:
 - 1) determining the percentage of direct package support the package would have if placed at said package placement, and making a determination of instability if a threshold is not met;

- 2) determining the effective support surface available to the package bottom surface if placed at said package placement, said effective support surface defined by an effective support surface boundary, and comparing said effective support surface to an defined gravity center region assigned to said unstacked identified package, said estimated gravity center region defined as a region on the bottom surface of said package through which the gravity center force vector of said unstacked package is likely to pass;
- 3) checking side support available to the package if placed at said package placement;
- 4) making a determination of instability if predetermined thresholds are not met in either of steps "2" and "3"; and
- 5) checking support surface distribution on said bottom surface of said package if placed at said package placement, and making a determination of stability if a predetermined threshold is met; and
- f) stacking the package only if a determination of stability is made for said package if placed at said package placement.